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## II. Market Structure and Current Trends

### A. Demand

The aluminum production cycle involves mining of aluminous ores (mainly bauxite), chemical refining of the bauxite into alumina, electrolytic reduction of the alumina to aluminum metals, and subsequent rolling, drawing, extrusion or casting to produce aluminum semi-finished products. In this sequence of operations, approximately 4-5 tons of bauxite yield 2 tons of alumina from which is produced 1 ton of aluminum metal.

Estimated 1974 United States consumption of bauxite was 20 million metric tons. Aluminum usage was estimated at 5.6 million tons. These figures represent an increase of 11% in bauxite demand and a decline of 2% in aluminum consumption. US aluminum demand in the fourth quarter of 1974 was down an estimated 25% over the fourth quarter of 1973. It is estimated that current demand is about one-third below last year's level.

For the world in 1973, the consumption figures were estimated to be: bauxite, 70 million tons; aluminum, 14 million tons. The aluminum consumption data includes recycled scrap.

C. Price

Bauxite, alumina and aluminum are not traded on commodity exchanges and only aluminum has a published price. Bauxite and alumina transactions are usually handled within integrated companies or are based on long-term contracts between vertically integrated aluminum companies and those not completely integrated. Published aluminum metal prices in the United States have tended to be stable for extended periods, having risen from 23¢ per pound in 1963, to 27.5¢ in early 1974. The effective selling prices, however, fluctuate substantially, with wide discounts from published prices during periods when refining capacity substantially exceeds demand (during 1970-71 when the published price was 29¢ and sales price was reported as low as 22¢ per pound. In contrast to the traditional price stability that has characterized the aluminum market, 1974 saw the producer price increase from 27½¢ to 39¢ per pound.

### III. Expected Trends Through 1980

#### A. Demand

At current relative prices of products substitutable for aluminum, United States aluminum demand is expected to increase in excess of 5% annually through 1980. The tight supply for aluminum which prevailed this past summer has now shifted to an environment of sharply rising producer inventories and accelerated production cutbacks as a result of the sharp drop in demand resulting from the recession the country finds itself in. Demand in 1975 may drop by over 9% for the year--assuming demand picks up from its current low level late in the second quarter of the year. There should be a sharp rebound in demand in 1976 followed by a period of more even growth of around 7% during 1977-80. If the relative price of aluminum were to double, widespread substitution eventually would occur, as demand is considered to be quite price sensitive. In many applications magnesium, copper, steel, zinc, wood and plastics could be used as substitutes for aluminum, depending on relative prices.

Bauxite demand is directly related to aluminum demand, and therefore is relatively insensitive to price changes. The doubling of bauxite prices last year by most of the major procurers added only about 3¢ per pound to aluminum prices and resulted in only a relatively small amount of substitution for aluminum metal.

B. Supply

The doubling of bauxite prices (i.e., from an estimated \$15 per ton to \$30 per ton at the current price of aluminum) by the Caribbean countries, will have little effect on US bauxite production for the next five years. Cost estimates indicate that higher bauxite taxes are making non-bauxite materials competitive with bauxite as a source of aluminum. Because of the high cost and lengthy time required to develop them, however, these substitutes are unlikely to become an important source of alumina in the 1970s and, even in the subsequent decade, will complement but probably not replace bauxite.

C. Price

Production costs of aluminum in the mid-1970s should justify a price of 45-50 cents per pound, with prices escalating to 55-60 cents per pound in the late 1970s. If the aluminum companies had to contend only with increased bauxite costs there seems to be no doubt they could accommodate these. However, when coupled with dramatic cost increases of power, labor, capital, and other raw materials, the final cost of aluminum in the last part of the decade may well be such that prices of aluminum will be in the 55-60¢ range. However, a review of price history of non-ferrous

metals shows that there have been extended periods when prices have not accurately reflected costs. Though these prices seem high by today's standards, and particularly when compared to 22-23 cent prices prevailing in 1971, they will be largely matched by competing materials at that time.

#### IV. International Bauxite Association

##### A. Position of the Association

Seven bauxite producing countries -- Australia, Guinea, Guyana, Jamaica, Sierra Leone, Surinam, and Yugoslavia -- met in February 1974 to form the International Bauxite Association. They subsequently have been joined by the Dominican Republic, Haiti, and Ghana. The ten member organization accounts for over 65% of the world's bauxite and account for about 80% of the bauxite/alumina trade. Jamaica, world's largest bauxite exporter, assumed the leadership role in the Association.

In June 1974, Jamaica levied a stiff new tax that increased its revenue from around \$2 per ton of bauxite mined to \$15.81 at present aluminum prices. The tax contained a novel feature in that for the first time government bauxite revenue is calculated as a share of the market value of the average aluminum content of bauxite as determined from US posted prices for primary aluminum

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ingot. This feature is intended to ensure that Jamaica benefits from rising aluminum prices while at the same time providing a floor under the tax rate to protect Jamaica from aluminum price declines.

Coming at a time when many bauxite exporting countries were suffering balance-of-payments strains, Jamaica's apparently successful imposition of the tax has spurred other bauxite exporters to take similar action. All Caribbean bauxite producers, with the help of Jamaican advisors, had by the end of 1974 negotiated new agreements with the aluminum companies along the lines of the Jamaican formula. In January 1975, the movement to increase tax revenues spread outside the Caribbean with the imposition of a similar tax by Guinea.

The association is presently trying to organize the revenue the countries get from the bauxite. The association has realized that it can not impose a single price for all bauxite. Instead the executive board is presently trying to develop a formula that would set the value of each countries bauxite taking account for variables such as the quality of the bauxite, distance of the deposits from market, and mining costs.

#### B. Possible Reaction

The aluminum companies are heavily dependent upon these countries for bauxite supplies and in the short run have

little choice but to accept their demands. Over the next several years, however, the companies probably will turn to countries that currently are not major producers to develop new supply sources. Nevertheless, even the latter probably will follow Jamaica's example once they become exporters.

A number of materials are close substitutes for aluminum, including steel, plastic, and copper. While in the long run the prices of these materials place a limit on the price of aluminum and, hence, on the price of bauxite, the availability, price, transportation requirements, and energy costs of substitutes must be weighed before the decision to bring them onstream is made.

Secondary recovery would intensify with higher prices, though this potential is limited. It is estimated that if the price of aluminum were doubled, the increased aluminum supply produced via secondary recovery would increase total aluminum supplies by only 5%.

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